

DICHLOROPROPENE

CAS number: 542-75-6

Synonyms: DCP, gamma-chloroallyl chloride, dichloropropylene, 1,3 Dichloro-1-propene, Trilone

Chemical formula: $C_3H_4Cl_2$

Workplace exposure standard (interim)

TWA: 1 ppm (4.5 mg/m³)

STEL: —

Peak limitation: —

Notations: Carc. 2; Sk; DSEN

IDLH: —

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

The TWA of 1 ppm (4.5 mg/m³) is recommended to reduce potential for kidney damage and irritation of the eyes, skin and respiratory tract of exposed workers.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

Discussion and conclusions

Dichloropropane (DCP) is traditionally used in agriculture as a fumigant and pesticide through soil injection or drip irrigation.

Available human data for DCP is largely limited to observations of workers exposed to elevated concentrations of DCP in industrial settings, which reported subclinical nephrotoxic effects. A sub-chronic study using various animal species reported a NOAEC of 1 ppm for effects on the kidney with a LOAEC of 3 ppm based on slight, reversible and microscopic changes observed in kidneys of male rats (ACGIH, 2018). While reported cases of malignant histiocytic leukaemia in humans exposed to DCP (ACGIH, 2018) indicate its suspected carcinogenic potential, there are insufficient epidemiological data to support its classification as a known or presumed human carcinogen.

The recommended TWA of 1 ppm (4.5 mg/m³) is derived directly from the NOAEC in rats in line with the ACGIH recommendation. Given the absence of supporting data in the primary sources a priority evaluation is recommended at the next scheduled review.

Recommendation for notations

Classified as a category 2 carcinogen, according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Classified as skin sensitiser and not a respiratory sensitiser according to the GHS.

A skin notation is recommended based on evidence of dermal absorption and adverse systemic effects in animals and reports of acute workplace exposures.

DRAFT

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1991	TWA: 1 ppm (4.5 mg/m³)
ACGIH	2005	TLV-TWA: 1 ppm (4.5 mg/m³)
<p>TLV-TWA is recommended to minimise the potential for reversible kidney damage and irritation of the eyes, skin and respiratory tract in exposed workers.</p> <p>Summary of data:</p> <p>Human data:</p> <ul style="list-style-type: none"> The effects of sub-chronic exposure on kidney and liver functions were examined for 14 Dutch workers employed in the flower bulb industry <ul style="list-style-type: none"> average airborne concentrations ranged 1.9–18.9 mg/m³ exposure led to a decrease in serum total bilirubin and serum creatinine concentrations and an increase in urine albumin and RBP exposures to elevated concentrations may induce subclinical nephrotoxic effects Case study reported 44 yr old male process operator in a pesticide manufacturing facility was likely sensitised to DD-95 (95% DCP) which led to acute bullous dermatitis on the dorsal skin of both feet Malignant histiocytic leukaemia and a case of acute myelomonocytic leukaemia reported in workers (firemen and a farmer) following exposure <ul style="list-style-type: none"> confounding factors suggested inadequate evidence of human carcinogenicity. <p>Animal data:</p> <ul style="list-style-type: none"> LC₅₀: 904 ppm (female rats, 4 h) and 846–990 ppm (male rats, 4 h) LD₅₀: 140–713 mg/kg (rats, oral) NOAEC of 1 ppm for kidney effects (rats, guinea pigs, rabbits, dogs, inhalation, 7 h/d, 5 d/wk, 6 mo) <ul style="list-style-type: none"> LOAEC of 3 ppm based on slight, reversible, microscopic changes in kidneys of male rats no effects identified upon sacrifice 3 mo post exposure NOAEL of 20.9 mg/m³ with LOAEL of 83.6 mg/m³ reported for mice and NOAEL of 83.6 mg/m³ with a LOAEL of 250.5 mg/m³ for rats based on urinary bladder and nasal epithelial histopathology Increase in the incidence of bronchoalveolar adenomas observed in male mice exposed to 272 mg/m³ after 24 mo Death of some rabbits following dermal application of 125 and 250 mg/kg as a 10% solution in corn oil Genotoxic effects inducing DNA damage in multiple organs when administered orally; <ul style="list-style-type: none"> inhalation exposure studies concluded not mutagenic to the male germ cells of rats at ≤150 ppm Not determined as a reproductive or developmental toxin <i>via</i> inhalation. <p>Based on evidence of skin penetration with subsequent mortality of treated rabbits, a skin notation is assigned.</p>		



Source	Year set	Standard
TLV-TWA based directly on the NOAEC of 1 ppm and LOAEC of 3 ppm identified in animals exposed seven hours a day and the LOAEC of 3 ppm reported in rats for slight, reversible effects on the kidneys, . Insufficient data available to recommend a SEN notation or a TLV-STEL.		
DFG	1998	NA
Summary of additional data: <ul style="list-style-type: none"> Multiple studies indicated that skin absorption, relative to inhalation, contributes to ≈2–5% of total body uptake for exposed humans LD₅₀: 125–504 mg/kg (human studies); significant skin irritation observed. 		
SCOEL	NA	NA
No report.		
OARS/AIHA	NA	NA
No report.		
HCOTN	NA	NA
No report.		

Secondary source reports relied upon

Source	Year	Additional information
IARC	✓ 1999	<ul style="list-style-type: none"> Sufficient evidence in experimental animals for carcinogenicity, but no epidemiological data relevant to its carcinogenicity in humans is available Classified as “possible carcinogen to humans” (Group 2B).
NTP	✓ 2019	<ul style="list-style-type: none"> Positive testing for chromosome aberrations in mice.
US EPA	✓ 2000	<ul style="list-style-type: none"> Inhalation RfC of 0.02 mg/m³ recommended based on a daily inhalation exposure of the general human population No available human epidemiological studies; as such, inhalation RfC was derived based on chronic inhalation study in mice and observed hypertrophy/hyperplasia of nasal respiratory epithelium Assessment of inhalation carcinogenicity is based on Lomax study (1989) in rats and mice exposed to up to 272 mg/m³ for 6 h/d, 5 d/yr for 2 yr IUR of 4 x 10⁻⁶ per µg/m³ is based on protection of lung cancer.
US NIOSH	✓ 2018	<ul style="list-style-type: none"> TWA 1 ppm (5 mg/m³) is recommended, with a skin notation.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic? Insufficient data

Is the chemical carcinogenic with a mutagenic mechanism of action? Insufficient data

Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	Skin, Sen
HCIS	—
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	Carcinogenicity – A3, Skin
DFG	Carcinogenicity – 2; H (skin), Sh (dermal sensitiser)
SCOEL	NA
HCOTN	NA
IARC	Carcinogenicity – Group 2B
US NIOSH	SK:SEN
NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations	

Skin notation assessment

Calculation	
Adverse effects in human case study:	yes
Dermal LD ₅₀ ≤ 1000 mg/kg:	yes
Dermal repeat-dose NOAEL ≤ 200 mg/kg:	No data
Dermal LD ₅₀ /Inhalation LD ₅₀ < 10:	Yes
In vivo dermal absorption rate > 10%:	No data
Estimated dermal exposure at WES > 10%:	No data
a skin notation is warranted	

IDLH

Is there a suitable IDLH value available? No

Additional information

Molecular weight:	110.97
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 4.54 mg/m ³ ; 1 mg/m ³ = 0.22 ppm
This chemical is used as a pesticide:	✓
This chemical is a biological product:	<input type="checkbox"/>



Molecular weight: 110.97

This chemical is a by-product of a process: ☐

A biological exposure index has been recommended by these agencies: ☐ ACGIH ☐ DFG ☐ SCOEL

Workplace exposure standard history

Year	Standard
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[Click here to enter year](#)

References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [TLVs® and BEIs® Guidelines section](#) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (1998) 1,3-Dichlorpropen (cis- und trans-) – MAK value documentation.

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National Toxicology Program (NTP) (2019). Testing Status of 1,3-Dichloropropene (Telone II) 10560-H.

Safe Work Australia (SWA) (2018). Workplace Exposure Standards for Airborne Contaminants

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US National Institute for Occupational Safety and Health (NIOSH) (2011) NIOSH Skin Notation Profiles: 1,3-Dichloropropene (1,3-D).